Investigation of the dust environment around Europa

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Abstract

Space in the vicinity of atmosphereless bodies in the Solar system is often populated by dust originating from the surface. Fragments of the surface are ejected mostly due to hypervelocity meteoroid impacts. It is also possible that material from sub-surface layers may be vented through cracks in the ice (as detected near Enceladus).
The understanding of Europa's dust cloud (and dust clouds of this sort in general) is done by mimicking micrometeoroid impact into simulated Europan regolith/ice using the light gas gun at the Open University. The research is complemented with impact modelling using the finite element hydrocode, ANSYS Autodyn 3D. The results are implemented in IDL in order to calculate the approximate dust cloud population (size and spatial density) of the surface fragments at different altitudes above Europa's surface.
It is, therefore, investigated whether orbit-based detection and analysis of material ejected from the surface may provide an alternative method for sampling material without landing, both quantitatively and qualitatively. Our current work is aimed at the understanding of the local dust fluxes and geometries at the orbital altitudes and its application to the design of a dust detector for an orbiter.

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